

a head location/posture estimation step of estimating a location/posture of a viewpoint of a player using the detected marker positions;

a mixed reality space image generation step of generating a virtual space image to be observed by the player based on the location/posture of the viewpoint of the player and model information; and

an image combining step of generating a mixed reality space image by combining the real space image with the virtual space image,

wherein the markers are laid out in the real space so that the markers to be used by only a given player are laid out at positions hidden by real objects when the markers are observed from the other player.--

REMARKS

Claims 1-3, 5-8 and 15-21 are pending in this application, with Claims 1, 15, 16, 18, 19, 20 and 21 being independent. Claims 4 and 9-14 have been cancelled without prejudice.

Claims 1, 5 and 15-19 have been amended. Applicants submit that support for the amendments can be found in the original disclosure, and therefore no new matter has been added.

Claims 4, 5, 8 and 15-17 are objected to. Although the Office Action does not state the basis for the objection, Applicants understand the objection to be that the claims contain allowable subject matter but are in improper form because they depend from a rejected base claim.

Claims 1-3, 6-7, 10-11 and 13 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,054,991 (Crane, et al.).

Claims 10, 11 and 13 also appear to be rejected as being anticipated by U.S. Patent No. 6,094,625 (Ralston).

Claim 9 is rejected under 35 U.S.C. §103(a) as being unpatentable over Crane, et al.

Claim 12 is rejected under 35 U.S.C. §103(a) as being unpatentable over Ralston.

Claims 14 and 18-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,064,749 (Hirota, et al.) in view of Crane, et al.

The rejections respectfully are traversed.

In one aspect of the invention as recited in Claim 1, a marker layout method for laying out markers in a real space as position indices upon presenting a mixed reality space comprises the step of laying out the markers to have a positional relationship that allows a given player not to observe markers to be used by only another player when a plurality of players who observe the mixed reality space within different movable ranges observe the mixed reality space. The markers to be used by only the given player are laid out at positions hidden by real objects when the markers are observed from the other player.

In another aspect, the invention is directed to a mixed reality space image generation method for generating a mixed reality space image which makes a player experience mixed reality by mixing a real space in which markers serving as position indices are laid out, and a virtual space. As recited in Claims 15 and 16, the method

comprises a marker detection step of detecting the markers from image data obtained by sensing the real space from a substantially viewpoint position of the player, a correcting step of correcting location/posture information of the player based on the markers detected by the marker detection step, and a mixed reality space image generation step of generating a mixed reality space image to be observed by the player, so the player observes virtual object images that do not include any images of the markers in marker regions including the markers from the image data.

As recited in Claim 15, the mixed reality space image generation step includes a step of substituting or overlaying images of the marker regions by predetermined virtual object images.

As recited in Claim 16, the mixed reality space image generation step includes a step of substituting or overlaying all the markers in the image data with predetermined virtual object images.

Claims 18 and 19 are directed to computer readable storage media and correspond substantially to Claims 15 and 16.

Newly-presented Claims 20 and 21 are directed to a mixed reality apparatus and a method for providing a mixed reality space shared by a plurality of players and each recites, among other things, inputting a real space image representing the real space, extracting pixels having a color that is predefined as a marker from the real space image, performing a labeling process to detect marker regions, and detecting positions of markers in the marker regions. Markers are laid out in the real space so that the markers to be used by only a given player are laid out at positions hidden by real objects when the markers are observed from another player.

Preliminary to discussing the relevant art, Applicants wish to point out that Claim 1 has been amended to include the features of allowable Claim 4, and allowable Claims 15 and 16 have been amended to be in independent form. Accordingly, Applicants submit that Claims 1-3, 5-8, 15 and 16 are allowable.

Turning to the rejection of the remaining independent claims, i.e., Claims 18 and 19, Applicants submit that Hirota, et al. discloses using landmarks laid out in the real space to enhance accuracy of registration of computer-generated images with real world objects.

Applicants submit that Crane, et al. discloses a virtual reality system 20 in which an operator perceives being in a virtual reality world 74 via a video display 60 in a helmet 26.

However, Applicants submit that neither Hirota, et al. nor Crane, et al., even in combination, discloses or suggests, among other things, substituting or overlaying images of the marker regions by predetermined virtual object images, as recited in Claim 18, or substituting or overlaying an image of a region including all the markers in the image data by predetermined virtual object images, as recited in Claim 19. What is more, as noted above, Claims 18 and 19 correspond to Claims 15 and 16, respectively, which should now be allowable.

Accordingly, withdrawal of the rejection of Claims 18 and 19 respectfully is requested.

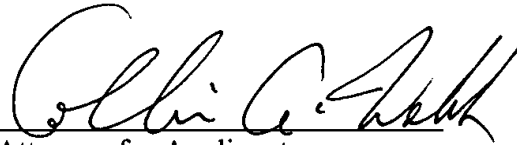
Newly-submitted Claims 20 and 21 are also submitted to be allowable because none of the applied art discloses or suggests, among other things, markers laid out in the

real space so that the markers to be used by only the given player are laid out at positions hidden by real objects when the markers are observed from another player.

For the foregoing reasons, Applicants submit that this application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections and objections set forth in the above-mentioned Office Action and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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APPENDIX

MARKED-UP VERSION SHOWING AMENDMENTS TO CLAIMS

1. (Amended) A marker layout method for laying out markers in a real space as position indices upon presenting a mixed reality space, comprising the step of:

laying out the markers to have a positional relationship that allows a given player not to observe markers to be used by only another player when a plurality of players who observe the mixed reality space within different movable ranges observe the mixed reality space,

wherein the markers to be used by only the given player are laid out at positions hidden by real objects when the markers are observed from the other player.

4. (Cancelled)

5. (Amended) The method according to claim [4] 1, wherein the real objects are laid out for an application that uses the mixed reality space.

9 through 14. (Cancelled)

15. (Amended) [The method according to claim 14,] A mixed reality space image generation method for generating a mixed reality space image which makes a player

experience mixed reality by mixing a real space in which markers serving as position indices are laid out, and a virtual space, comprising:

a marker detection step of detecting the markers from image data obtained by sensing the real space from a substantially viewpoint position of the player;

a correcting step of correcting location/posture information of the player based on the markers detected by said marker detection step; and

a mixed reality space image generation step of generating a mixed reality space image to be observed by the player, so the player observes virtual object images that do not include any images of the markers in marker regions including the markers from the image data.

wherein [the] said mixed reality space image generation step includes [the] a step of substituting or overlaying images of the marker regions by predetermined virtual object images.

16. (Amended) [The method according to claim 14,] A mixed reality space image generation method for generating a mixed reality space image which makes a player experience mixed reality by mixing a real space in which markers serving as position indices are laid out, and a virtual space, comprising:

a marker detection step of detecting the markers from image data obtained by sensing the real space from a substantially viewpoint position of the player;

a correcting step of correcting location/posture information of the player based on the markers detected by said marker detection step; and

a mixed reality space image generation step of generating a mixed reality space image to be observed by the player, so the player observes virtual object images that do not include any images of the markers in marker regions including the markers from the image data,

wherein [the] said mixed reality space image generation step includes [the] a step of substituting or overlaying [an image of a region including] all the markers in the image data [by a] with predetermined virtual object [image] images.

17. (Amended) The method according to claim 15, wherein the predetermined virtual [objects are] object images are images of plane patches with the same or similar texture, size, location and posture of [the] respective marker regions before the markers are laid out.

18. (Amended) A computer readable storage medium that stores a program which can be executed by a computer, said program making the computer perform the steps of [which executes the program function as]:

[a mixed reality apparatus for making a player experience mixed reality by making the player observe a mixed reality space image obtained by mixing a real space in which markers serving as position indices are laid out, and a virtual space, comprising:]

a marker detection [means for] step of detecting [the] markers, serving as position indices, from image data obtained by sensing [the] a real space from a substantially viewpoint position of [the] a player; [and]

a correcting step of correcting location/posture information of the player based on the markers detected by said marker detection step; and

a mixed reality space image generation [means for] step of generating [the] a mixed reality space image to be observed by the player, so the player observes virtual object images that do not include any images of the markers in [surrounding] marker regions [(marker regions)] including the markers [in] from the image data,

wherein said mixed reality space image generation step includes substituting or overlaying images of the marker regions by predetermined virtual object images.

19. (Amended) A computer readable storage medium [which] that stores [a mixed reality space image generation program for generating a mixed reality space image which makes a player experience mixed reality by mixing a real space in which markers serving as position indices are laid out, and a virtual space, storing] a program which can be executed by a computer, said program making the computer perform the steps of:

a correcting step of correcting location/posture information of the player based on the markers detected by said marker detection step; and

a marker detection [program] step of detecting the markers, serving as position

indices, from image data obtained by sensing [the] a real space from a substantially
viewpoint position of [the] a player; [and]

a mixed reality space image generation [program] step of generating [the] a mixed
reality space image to be observed by the player, so the player observes virtual object
images that do not include any images of the markers in [surrounding] marker regions
[(marker regions)] including the markers [in] from the image data,

wherein said mixed reality space image generation step includes substituting or
overlaying an image of a region including all the markers in the image data by
predetermined virtual object images.